

# IMPORTANT NOTICE

10 December 2015

## 1. Global joint venture starts operations as WeEn Semiconductors

Dear customer,

As from November 9th, 2015 NXP Semiconductors N.V. and Beijing JianGuang Asset Management Co. Ltd established Bipolar Power joint venture (JV), **WeEn Semiconductors**, which will be used in future Bipolar Power documents together with new contact details.

In this document where the previous NXP references remain, please use the new links as shown below.

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Thank you for your cooperation and understanding,

WeEn Semiconductors



# ACTT8B-800C0

## AC Thyristor Triac power switch

12 March 2014

Product data sheet

### 1. General description

AC Thyristor Triac power switch in a SOT404 (D2PAK) surface mountable plastic package with self-protective clamping capabilities against low and high energy transients.

### 2. Features and benefits

- Clamping structure ensuring safe high over-voltage withstand capability
- High minimum  $I_{GT}$  for guaranteed immunity to gate noise
- Full cycle AC conduction
- Over-voltage withstand capability to IEC 61000-4-5
- Pin compatible with standard triacs
- Planar passivated for voltage ruggedness and reliability
- Protective self turn-on capability for high energy transients
- Safe clamping capability for low energy over-voltage transients
- Less sensitive gate for high noise immunity
- Surface mountable package
- Triggering in three quadrants only
- Very high immunity to false turn-on by  $dV/dt$

### 3. Applications

- AC fan, pump and compressor controls
- Highly inductive, resistive and safety loads
- Large and small appliances (White Goods)
- Reversing induction motor controls

### 4. Quick reference data

Table 1. Quick reference data

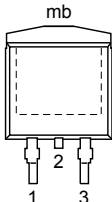
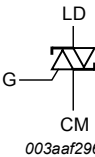
| Symbol       | Parameter                            | Conditions                                                                                                             | Min | Typ | Max | Unit |
|--------------|--------------------------------------|------------------------------------------------------------------------------------------------------------------------|-----|-----|-----|------|
| $V_{DRM}$    | repetitive peak off-state voltage    |                                                                                                                        | -   | -   | 800 | V    |
| $I_{TSM}$    | non-repetitive peak on-state current | full sine wave; $T_{j(init)} = 25\text{ °C}$ ; $t_p = 20\text{ ms}$ ; <a href="#">Fig. 4</a> ; <a href="#">Fig. 5</a>  | -   | -   | 80  | A    |
| $T_j$        | junction temperature                 |                                                                                                                        | -   | -   | 125 | °C   |
| $I_{T(RMS)}$ | RMS on-state current                 | full sine wave; $T_{mb} \leq 105\text{ °C}$ ; <a href="#">Fig. 1</a> ; <a href="#">Fig. 2</a> ; <a href="#">Fig. 3</a> | -   | -   | 8   | A    |



| Symbol                         | Parameter                             | Conditions                                                                                                                                                                    | Min  | Typ | Max | Unit             |
|--------------------------------|---------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|-----|-----|------------------|
| $V_{PP}$                       | peak pulse voltage                    | $T_j = 25\text{ }^{\circ}\text{C}$ ; non-repetitive, off-state; Fig. 6                                                                                                        | -    | -   | 2   | kV               |
| <b>Static characteristics</b>  |                                       |                                                                                                                                                                               |      |     |     |                  |
| $I_{GT}$                       | gate trigger current                  | $V_D = 12\text{ V}$ ; $I_T = 100\text{ mA}$ ; LD+ G+; $T_j = 25\text{ }^{\circ}\text{C}$ ; Fig. 8                                                                             | 5    | -   | 30  | mA               |
|                                |                                       | $V_D = 12\text{ V}$ ; $I_T = 100\text{ mA}$ ; LD+ G-; $T_j = 25\text{ }^{\circ}\text{C}$ ; Fig. 8                                                                             | 5    | -   | 30  | mA               |
|                                |                                       | $V_D = 12\text{ V}$ ; $I_T = 100\text{ mA}$ ; LD- G-; $T_j = 25\text{ }^{\circ}\text{C}$ ; Fig. 8                                                                             | 5    | -   | 30  | mA               |
| $V_{CL}$                       | clamping voltage                      | $I_{CL} = 0.1\text{ mA}$ ; $t_p = 1\text{ ms}$ ; $T_j = 25\text{ }^{\circ}\text{C}$                                                                                           | 850  | -   | -   | V                |
| <b>Dynamic characteristics</b> |                                       |                                                                                                                                                                               |      |     |     |                  |
| $dV_D/dt$                      | rate of rise of off-state voltage     | $V_{DM} = 536\text{ V}$ ; $T_j = 125\text{ }^{\circ}\text{C}$ ; ( $V_{DM} = 67\%$ of $V_{DRM}$ ); exponential waveform; gate open circuit                                     | 2000 | -   | -   | V/ $\mu\text{s}$ |
| $dI_{com}/dt$                  | rate of change of commutating current | $V_D = 400\text{ V}$ ; $T_j = 125\text{ }^{\circ}\text{C}$ ; $I_{T(RMS)} = 8\text{ A}$ ; $dV_{com}/dt = 20\text{ V}/\mu\text{s}$ ; (snubberless condition); gate open circuit | 8    | -   | -   | A/ms             |

## 5. Pinning information

Table 2. Pinning information

| Pin | Symbol | Description         | Simplified outline                                                                                               | Graphic symbol                                                                                         |
|-----|--------|---------------------|------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|
| 1   | CM     | common              |  <p><b>D2PAK (SOT404)</b></p> |  <p>003aaf296</p> |
| 2   | LD     | load                |                                                                                                                  |                                                                                                        |
| 3   | G      | gate                |                                                                                                                  |                                                                                                        |
| mb  | LD     | mounting base; load |                                                                                                                  |                                                                                                        |

## 6. Ordering information

Table 3. Ordering information

| Type number  | Package |                                                                                  |         |
|--------------|---------|----------------------------------------------------------------------------------|---------|
|              | Name    | Description                                                                      | Version |
| ACTT8B-800C0 | D2PAK   | plastic single-ended surface-mounted package (D2PAK); 3 leads (one lead cropped) | SOT404  |

## 7. Marking

Table 4. Marking codes

| Type number  | Marking code |
|--------------|--------------|
| ACTT8B-800C0 | ACTT8B-800C0 |

## 8. Limiting values

Table 5. Limiting values

In accordance with the Absolute Maximum Rating System (IEC 60134).

| Symbol              | Parameter                            | Conditions                                                                                                                                          |  | Min | Max | Unit                   |
|---------------------|--------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|--|-----|-----|------------------------|
| $V_{\text{DRM}}$    | repetitive peak off-state voltage    |                                                                                                                                                     |  | -   | 800 | V                      |
| $I_{\text{T(RMS)}}$ | RMS on-state current                 | full sine wave; $T_{\text{mb}} \leq 105\text{ }^{\circ}\text{C}$ ; <a href="#">Fig. 1</a> ; <a href="#">Fig. 2</a> ; <a href="#">Fig. 3</a>         |  | -   | 8   | A                      |
| $I_{\text{TSM}}$    | non-repetitive peak on-state current | full sine wave; $T_{\text{j(init)}} = 25\text{ }^{\circ}\text{C}$ ; $t_{\text{p}} = 20\text{ ms}$ ; <a href="#">Fig. 4</a> ; <a href="#">Fig. 5</a> |  | -   | 80  | A                      |
|                     |                                      | full sine wave; $T_{\text{j(init)}} = 25\text{ }^{\circ}\text{C}$ ; $t_{\text{p}} = 16.7\text{ ms}$                                                 |  | -   | 88  | A                      |
| $I^2t$              | $I^2t$ for fusing                    | $t_{\text{p}} = 10\text{ ms}$ ; sine-wave pulse                                                                                                     |  | -   | 32  | $\text{A}^2\text{s}$   |
| $di_{\text{T}}/dt$  | rate of rise of on-state current     | $I_{\text{T}} = 12\text{ A}$ ; $I_{\text{G}} = 0.2\text{ A}$ ; $di_{\text{G}}/dt = 0.2\text{ A}/\mu\text{s}$                                        |  | -   | 100 | $\text{A}/\mu\text{s}$ |
| $I_{\text{GM}}$     | peak gate current                    | $t = 20\text{ }\mu\text{s}$                                                                                                                         |  | -   | 2   | A                      |
| $P_{\text{GM}}$     | peak gate power                      |                                                                                                                                                     |  | -   | 5   | W                      |
| $P_{\text{G(AV)}}$  | average gate power                   | over any 20 ms period                                                                                                                               |  | -   | 0.5 | W                      |
| $T_{\text{stg}}$    | storage temperature                  |                                                                                                                                                     |  | -40 | 150 | $^{\circ}\text{C}$     |
| $T_{\text{j}}$      | junction temperature                 |                                                                                                                                                     |  | -   | 125 | $^{\circ}\text{C}$     |
| $V_{\text{PP}}$     | peak pulse voltage                   | $T_{\text{j}} = 25\text{ }^{\circ}\text{C}$ ; non-repetitive, off-state; <a href="#">Fig. 6</a>                                                     |  | -   | 2   | kV                     |

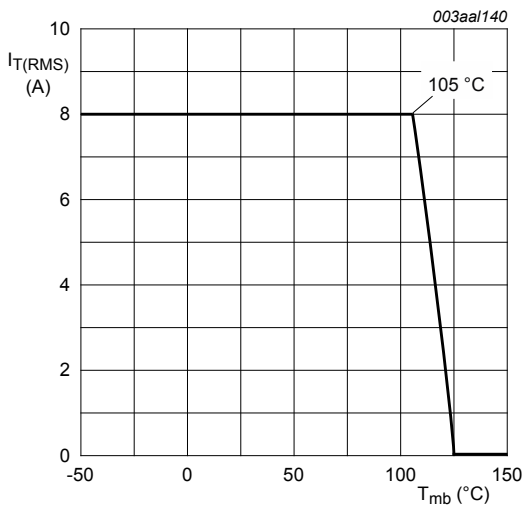
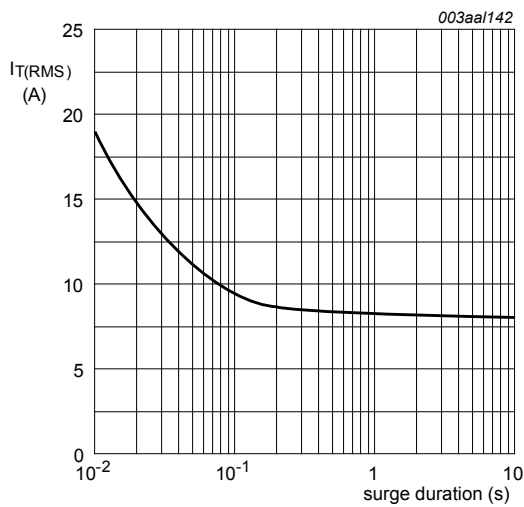


Fig. 1. RMS on-state current as a function of mounting base temperature; maximum values



f = 50 Hz;  $T_{mb}$  = 105 °C

Fig. 2. RMS on-state current as a function of surge duration; maximum values

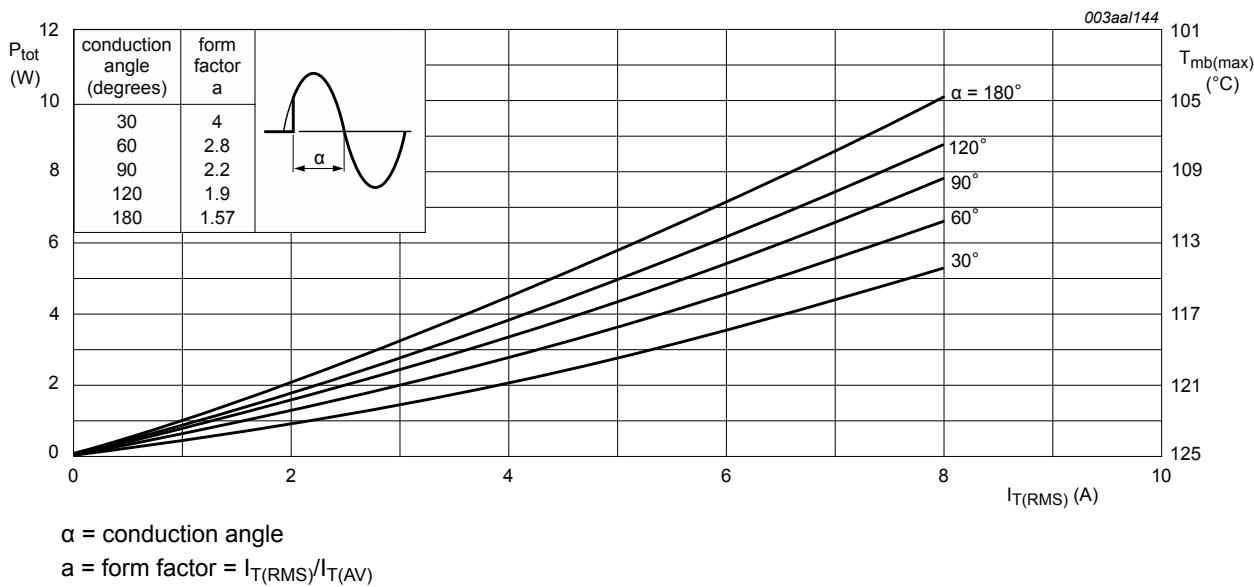


Fig. 3. Total power dissipation as a function of RMS on-state current; maximum values

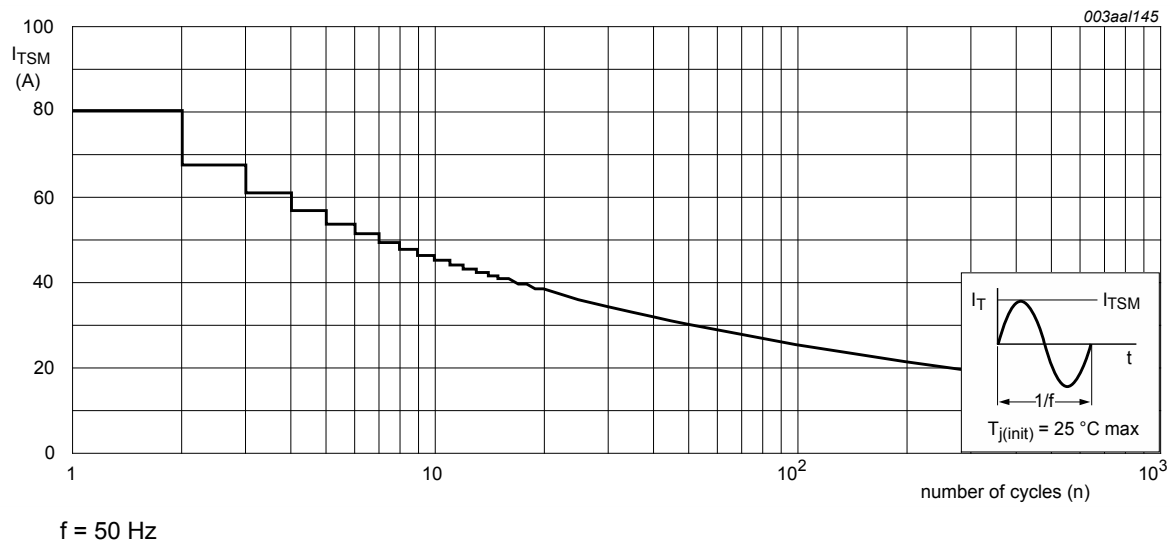


Fig. 4. Non-repetitive peak on-state current as a function of the number of sinusoidal current cycles; maximum values

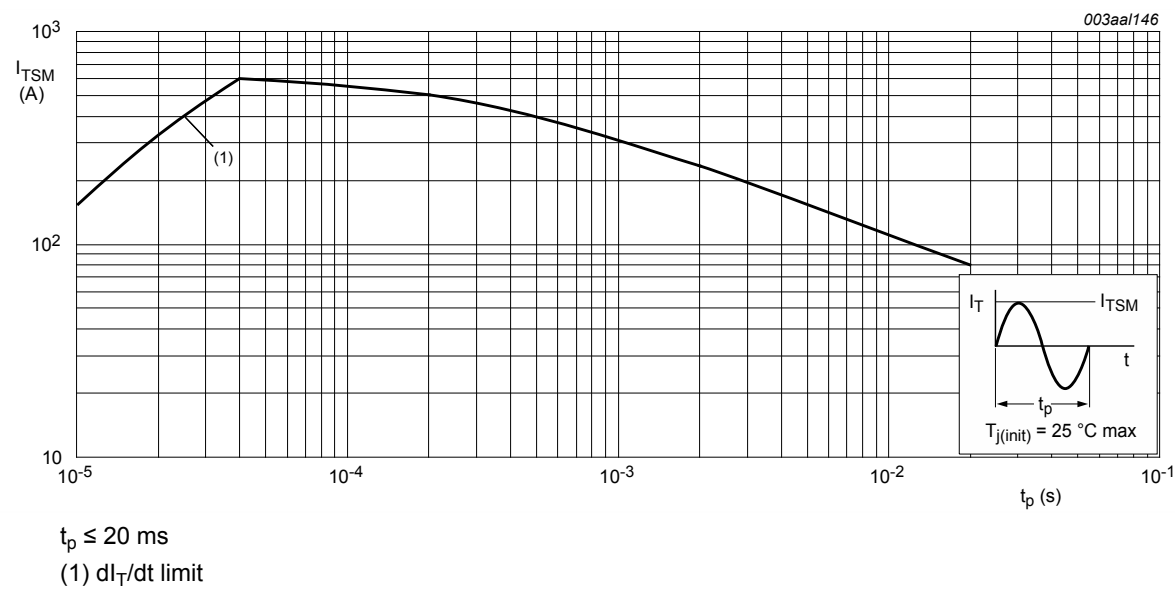


Fig. 5. Non-repetitive peak on-state current as a function of pulse width; maximum values

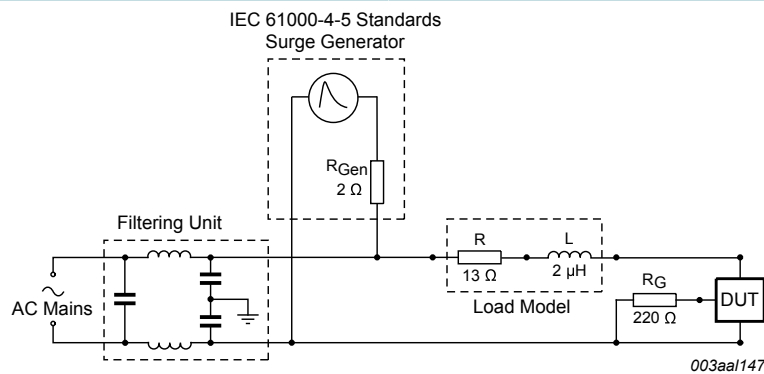
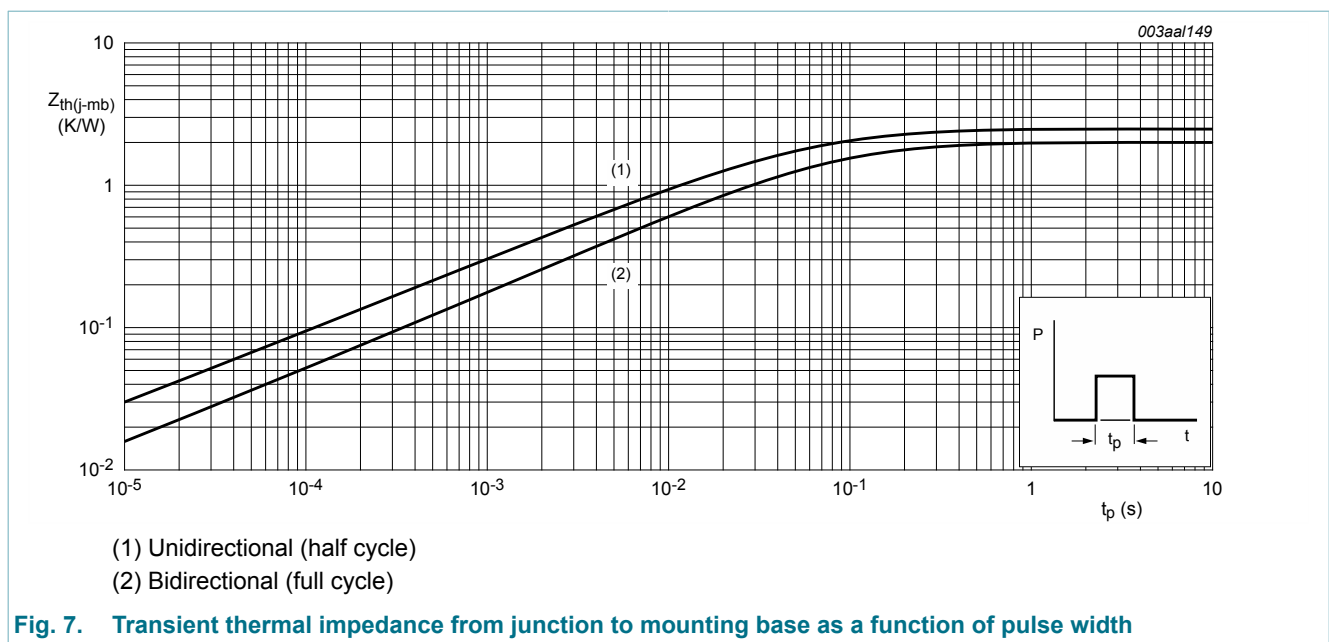


Fig. 6. Test circuit for inductive and resistive loads with conditions equivalent to IEC 61000-4-5

## 9. Thermal characteristics

Table 6. Thermal characteristics

| Symbol         | Parameter                                         | Conditions                                       | Min | Typ | Max | Unit |
|----------------|---------------------------------------------------|--------------------------------------------------|-----|-----|-----|------|
| $R_{th(j-mb)}$ | thermal resistance from junction to mounting base | full cycle; <a href="#">Fig. 7</a>               | -   | -   | 2   | K/W  |
|                |                                                   | half cycle; <a href="#">Fig. 7</a>               | -   | -   | 2.4 | K/W  |
| $R_{th(j-a)}$  | thermal resistance from junction to ambient       | in free air; printed circuit board (FR4) mounted | -   | 55  | -   | K/W  |

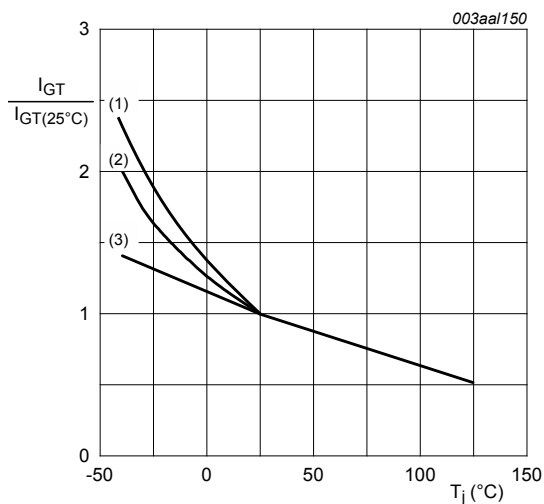


## 10. Characteristics

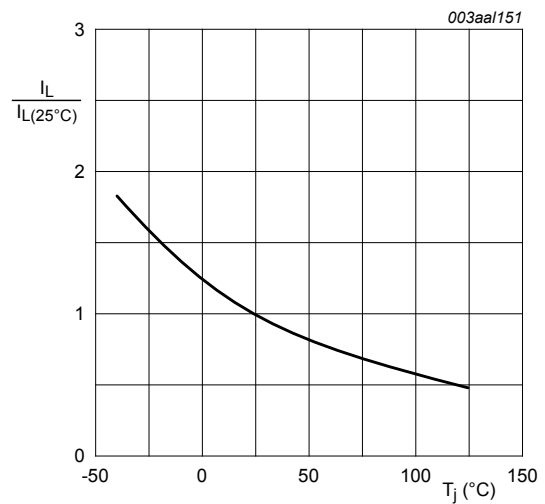
Table 7. Characteristics

| Symbol                        | Parameter            | Conditions                                                                                                         | Min | Typ | Max | Unit |
|-------------------------------|----------------------|--------------------------------------------------------------------------------------------------------------------|-----|-----|-----|------|
| <b>Static characteristics</b> |                      |                                                                                                                    |     |     |     |      |
| $I_{GT}$                      | gate trigger current | $V_D = 12\text{ V}$ ; $I_T = 100\text{ mA}$ ; LD+ G+;<br>$T_j = 25\text{ }^\circ\text{C}$ ; <a href="#">Fig. 8</a> | 5   | -   | 30  | mA   |
|                               |                      | $V_D = 12\text{ V}$ ; $I_T = 100\text{ mA}$ ; LD+ G-;<br>$T_j = 25\text{ }^\circ\text{C}$ ; <a href="#">Fig. 8</a> | 5   | -   | 30  | mA   |
|                               |                      | $V_D = 12\text{ V}$ ; $I_T = 100\text{ mA}$ ; LD- G-;<br>$T_j = 25\text{ }^\circ\text{C}$ ; <a href="#">Fig. 8</a> | 5   | -   | 30  | mA   |
| $I_L$                         | latching current     | $V_D = 12\text{ V}$ ; $I_G = 100\text{ mA}$ ; LD+ G+;<br>$T_j = 25\text{ }^\circ\text{C}$ ; <a href="#">Fig. 9</a> | -   | -   | 50  | mA   |

| Symbol                         | Parameter                             | Conditions                                                                                                                                                                  | Min  | Typ  | Max | Unit             |
|--------------------------------|---------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------|-----|------------------|
|                                |                                       | $V_D = 12\text{ V}$ ; $I_G = 100\text{ mA}$ ; LD+ G-;<br>$T_j = 25\text{ }^\circ\text{C}$ ; Fig. 9                                                                          | -    | -    | 70  | mA               |
|                                |                                       | $V_D = 12\text{ V}$ ; $I_G = 100\text{ mA}$ ; LD- G-;<br>$T_j = 25\text{ }^\circ\text{C}$ ; Fig. 9                                                                          | -    | -    | 50  | mA               |
| $I_H$                          | holding current                       | $V_D = 12\text{ V}$ ; $T_j = 25\text{ }^\circ\text{C}$ ; Fig. 10                                                                                                            | -    | -    | 35  | mA               |
| $V_T$                          | on-state voltage                      | $I_T = 10\text{ A}$ ; $T_j = 25\text{ }^\circ\text{C}$ ; Fig. 11                                                                                                            | -    | 1.3  | 1.5 | V                |
| $V_{GT}$                       | gate trigger voltage                  | $V_D = 12\text{ V}$ ; $I_T = 100\text{ mA}$ ; $T_j = 25\text{ }^\circ\text{C}$ ;<br>Fig. 12                                                                                 | -    | 0.8  | 1   | V                |
|                                |                                       | $V_D = 400\text{ V}$ ; $I_T = 100\text{ mA}$ ; $T_j = 125\text{ }^\circ\text{C}$ ;<br>Fig. 12                                                                               | 0.2  | 0.45 | -   | V                |
| $I_D$                          | off-state current                     | $V_D = 800\text{ V}$ ; $T_j = 25\text{ }^\circ\text{C}$                                                                                                                     | -    | -    | 10  | $\mu\text{A}$    |
|                                |                                       | $V_D = 800\text{ V}$ ; $T_j = 125\text{ }^\circ\text{C}$                                                                                                                    | -    | -    | 0.5 | mA               |
| $V_{CL}$                       | clamping voltage                      | $I_{CL} = 0.1\text{ mA}$ ; $t_p = 1\text{ ms}$ ; $T_j = 25\text{ }^\circ\text{C}$                                                                                           | 850  | -    | -   | V                |
| <b>Dynamic characteristics</b> |                                       |                                                                                                                                                                             |      |      |     |                  |
| $dV_D/dt$                      | rate of rise of off-state voltage     | $V_{DM} = 536\text{ V}$ ; $T_j = 125\text{ }^\circ\text{C}$ ; ( $V_{DM} = 67\%$ of $V_{DRM}$ ); exponential waveform; gate open circuit                                     | 2000 | -    | -   | V/ $\mu\text{s}$ |
| $dI_{com}/dt$                  | rate of change of commutating current | $V_D = 400\text{ V}$ ; $T_j = 125\text{ }^\circ\text{C}$ ; $I_{T(RMS)} = 8\text{ A}$ ; $dV_{com}/dt = 20\text{ V}/\mu\text{s}$ ; (snubberless condition); gate open circuit | 8    | -    | -   | A/ms             |



**Fig. 8. Normalized gate trigger current as a function of junction temperature**



**Fig. 9. Normalized latching current as a function of junction temperature**



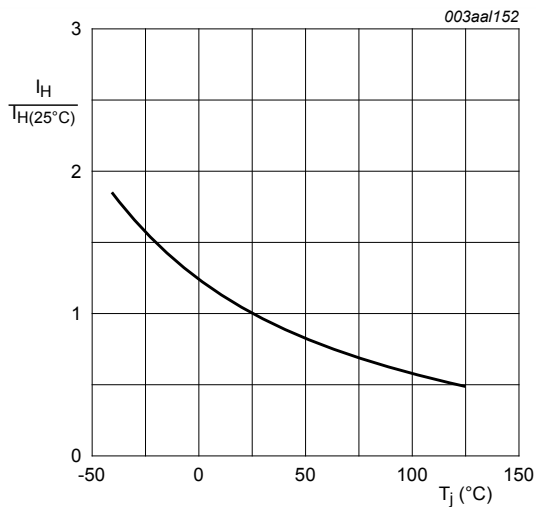
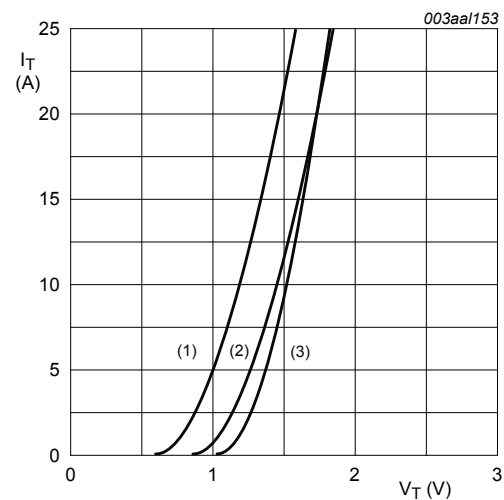


Fig. 10. Normalized holding current as a function of junction temperature



$V_o = 1.103 \text{ V}$ ;  $R_s = 0.034 \text{ } \Omega$   
(1)  $T_j = 125^\circ\text{C}$ ; typical values  
(2)  $T_j = 125^\circ\text{C}$ ; maximum values  
(3)  $T_j = 25^\circ\text{C}$ ; maximum values

Fig. 11. On-state current as a function of on-state voltage

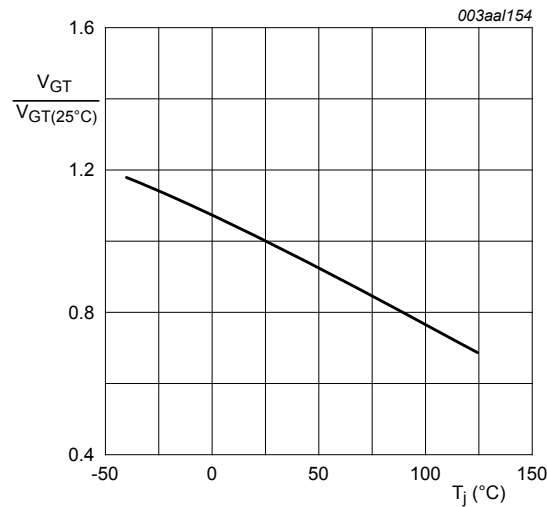


Fig. 12. Normalized gate trigger voltage as a function of junction temperature

11. Package outline

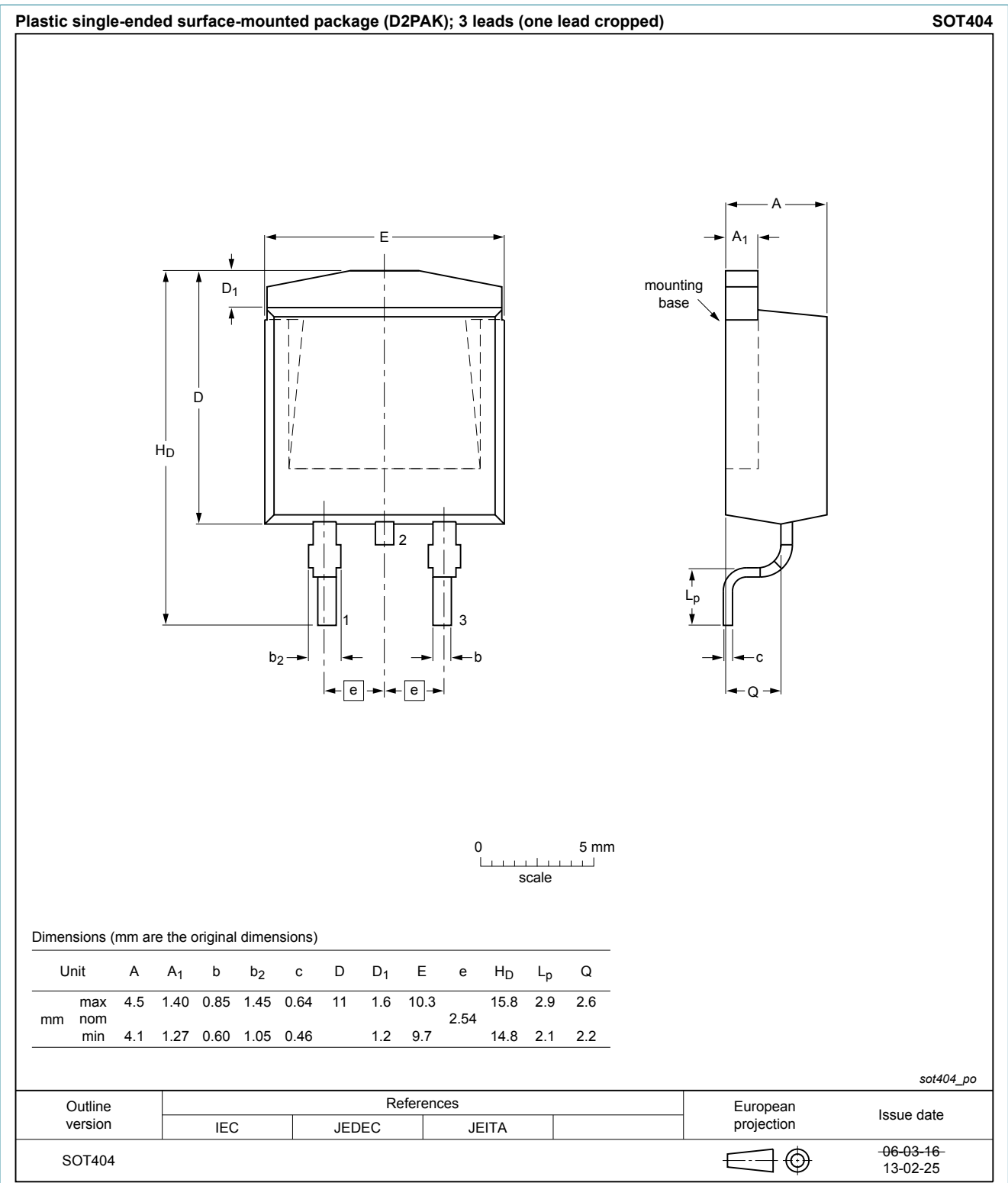
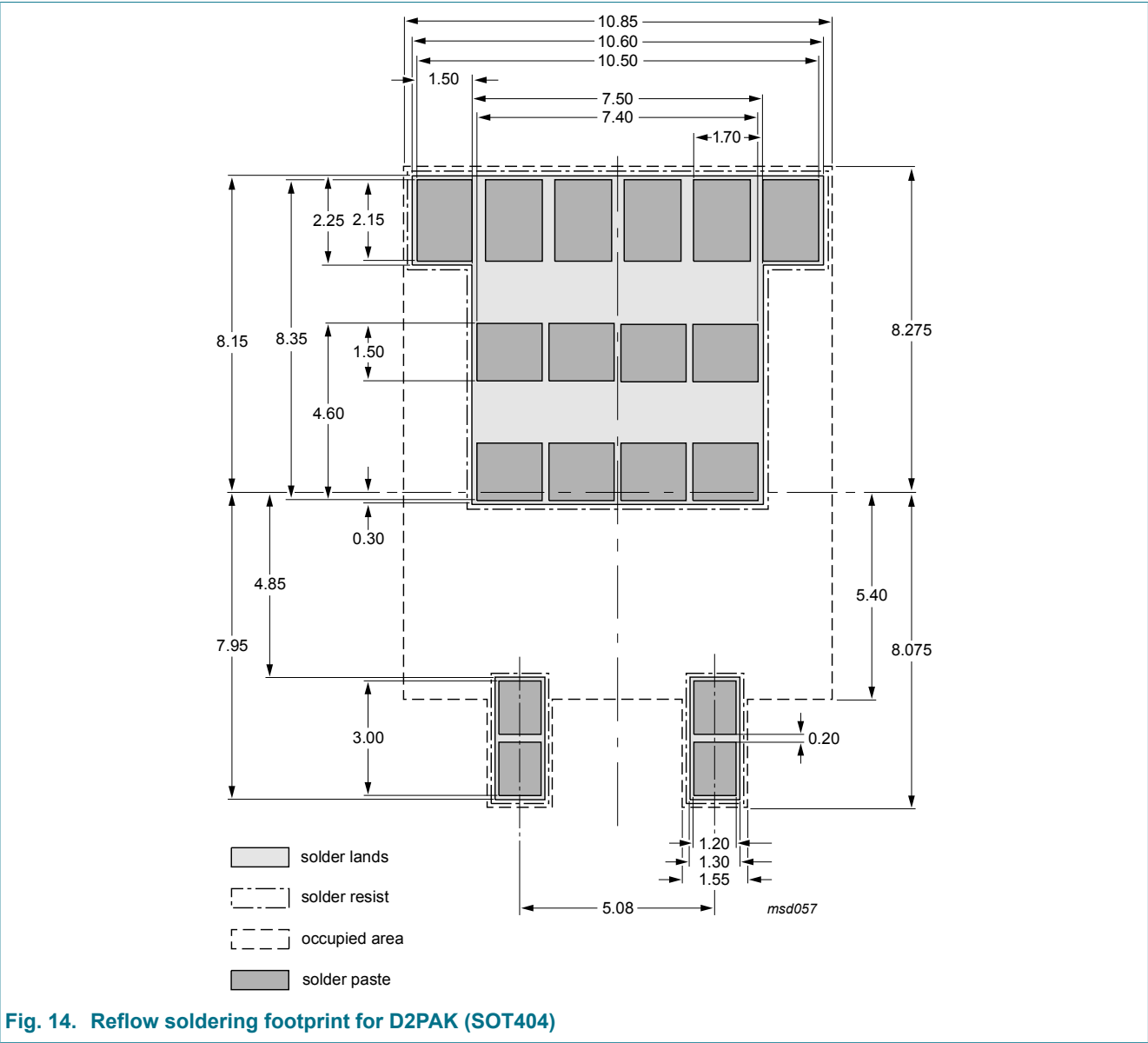


Fig. 13. Package outline D2PAK (SOT404)

12. Soldering



## 13. Legal information

### 13.1 Data sheet status

| Document status [1][2]         | Product status [3] | Definition                                                                            |
|--------------------------------|--------------------|---------------------------------------------------------------------------------------|
| Objective [short] data sheet   | Development        | This document contains data from the objective specification for product development. |
| Preliminary [short] data sheet | Qualification      | This document contains data from the preliminary specification.                       |
| Product [short] data sheet     | Production         | This document contains the product specification.                                     |

- [1] Please consult the most recently issued document before initiating or completing a design.
- [2] The term 'short data sheet' is explained in section "Definitions".
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14. Contents

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